Beyond Student Centred Learning: Towards Socially Response-able Mathematics Education

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This presentation discusses the origins and limitations of the movement towards the student centred approach in mathematics education. It identifies the emergent learning theories of the last century, the human rights argument as well as the critical education movement and factors supporting a student centred curriculum. However, such a focus on the student fails to take into consideration the complexity of the classroom and in particular the rights and needs of the teacher. More importantly, uncritical adoption of student centred education hides the important social aspects in mathematics education. Based on the discourse of ethics as elaborated by Levinas, it argues for a socially responsible (in its original meaning response-able) mathematics education. The implications of this approach to the curriculum and pedagogy in mathematics education are discussed. The challenge for the socially response-able mathematics education is to support the teacher to be able to respond to the needs of the student and support the students to be able to respond to the needs of their lives.

The term student centred (sometimes called child-centred) education has become a widely accepted canon for educational design and classroom teaching – albeit it remains not well defined and, arguably, in many countries around the world, more aspired to than actually practiced. It is not the intention here to present a detailed critical discussion of the different theories that hold this perspective. Rather, in the first part of the presentation, I will attempt to present a wide-brush discussion of the main and varied sources of its discourse and point out some of its limitations. My choice of the term "beyond" in the title is a challenge for not abandoning this dogma and going back to the so called "traditional" forms of teaching and learning but to build upon it towards highlighting the role of the social dimension in education. Hence, I will adopt a critical approach to the term. As Christie (2005) argues in another context, we need to "work *with* and work *against*" (p. 240) the construct at the same time. In the second part of the presentation, I will outline an approach to mathematics education that is based on the ethical concept of *responsibility* – or its original meaning *response-ability*. I will conclude the presentation by discussing some implications for this approach to curriculum and pedagogy.

Some Origins of the Student Centred Approach

For our purposes here, I will identify three different, although related, sources of the discourse on student centred approach. First, the contributions of many theorists of the past century such as John Dewey, Jean Piaget, Lev Vygotsky and Carl Rogers have challenged our thinking about how learning occurs in children and have lead to theories and practices known as constructivism (or more appropriately, constructivisms, e.g. Maypole & Davies, 2001) that highlight the active role of students in learning and hence

in educational planning and execution. Such varied theories contain some common elements. They point out that teaching is not equal to learning – that is what students learn is not the same as what we attempt to teach; students are active participants in the construction of their own knowledge development; knowledge is not conveyed or transmitted; and learning occurs as a result of actions and reflections by the students and negotiated through working with others. Lastly, knowledge is meaningful if it is related to a student's *interest* and past experiences. (I have italicised the word interest since I will discuss it further below.)

The second source of the student centred learning relates to a human rights perspective. Increasingly children are not seen as adults-in-preparation but as citizens in their own right. The United Nations (UN) Convention on the Rights of the Child[1] came into force in 1990, not without some controversy, as a universal acknowledgement of rights of children. The Convention sets out standards which ensure that rights apply to all young people without exception, that the best *interests* of all young people must be of primary concern and that the views of young people must be taken into account. In educational discourse the movement of student voices (Cook-Sather, 2006; Fielding, 2004) represent a dual acknowledgement of students' rights to be involved in decision making in education and of the pedagogical value of such involvement.

Lastly, the focus on student centred education can be traced to the rise of the critical education movement within general education (e.g. Michael Apple, Paulo Freire) and within mathematics education (Franskstein, 1983; Skovsmose 1994). From this perspective, education is not only about preparing young people for work or a consumer society but also as a vehicle of 'empowerment' and a means of developing in young people active citizenship. Similarly, democratic participation is not only preparing young people for their future society but it implies active participation in decision making in their school and classroom.

What is the Student Centred Approach?

To understand the student centred approach it is helpful to compare it with its alternatives. The *teacher centred* education places the focus on the teachers as main source of teaching leadership in the classroom and hence as the main target of research and reform in education. Teachers' knowledge or ability and teaching methods become central to both understanding what is happening in the classroom and to reforming it. Similarly a *content centred* education focuses on the disciplinary knowledge being taught, its structure and methods of knowledge generation. From this perspective, the content of the curriculum and sequencing of topics become the focus of attention of educational design and delivery. In contrast, a student centred learning approach focuses on the needs of the students and their abilities and learning styles rather than teachers, administrators or official curriculum. Students' *interest* takes precedence over the needs of the curriculum or of society.

Perhaps few notes on these alternative approaches are in order. First, due to the great hegemony of a student centred approach in the current educational literature, it is difficult to find a theoretical defence of either content centred or teacher centred learning. In fact they are often dismissed together under the banner of traditional teaching and learning in favour of a student centred approach. Secondly, I note that at different

[1] See http://www.unicef.org/crc/

periods in the history of research in mathematics we have oscillated from one of these foci to the other. Similarly, the emphasis has varied from one country to another. For example, in the first half of the 20th century, and in particular in the USA, curriculum design was based on rational or scientific basis and tended to be content centred. Curriculum was conceived in the writings of Ralph Tyler (1949) as a product that could be achieved through rational and systematic planning following well formulated steps consisting of identification of educational purposes, experiences likely to attain them, their organisation, and assessment. This understanding of the curriculum lead to educational research that looked at what kind of mathematics was needed for everyday life and for careers. Mathematics identified in this manner gave rise to the content taught in school. A relatively more recent development in the second half of the last century the New Math movement which dominated mathematics education in the USA and to a lesser extent Europe and other countries brought this content focus to a new level in taking the structure of mathematics as the organizer of school mathematics. At the same time in Europe (e.g. Piaget) and the then USSR (e.g. Vygotsky) concentrated on the child's mental development and the effect of instruction on mental development (Kilpatrick & Wirszup, 1996). These more student centred approaches gave rise to theories of constructivism that has become a worldwide movement (e.g. Davis, Maher & Nodding, 1990).

There are signs of change in this focus back to the teacher. At the turn of the millennium, along with a colleague from Mexico (Atweh & Arias Ochoa, 2001) we argued that as a result of the failures of many of the reforms in education that dominated the last three decades of the past century (Sprinthall, Reiman & Thies-Sprinthall, 1996), there has been a re-focus of attention on the role of the teachers and their needs in educational policy and research. Such focus is illustrated by the significant increase in research studies and international publications on teachers' concerns and teacher change as well as the increase in various forms of involvement of teachers in research activities (Atweh, 2004).

Limitations of Student Centred Learning

In the current educational climate that is dominated by increasing government control and standardisation of the curriculum and an increasingly widespread adoption of national testing, teachers face considerable pressure to maximize students' achievement and performance on externally specified criteria. Also, increasingly, students' achievement is used for the purposes of school funding and teacher promotion. Arguably, these demands on teachers act against building pedagogical experiences based on the individual student's interests and abilities. The double message given to teachers is that on one hand, society holds the teacher as responsible for the student learning and on the other hand, from student centred discourse, the responsibility lies with students.

Further, the everyday reality of many classrooms around the world discourages the implementation of a student centred approach. Recent TIMSS studies have demonstrated that class size in many counties vary considerably. Significant variations were also found between public and private schools and between urban and rural schools. Class sizes of around 50 students are not uncommon in many countries around the world. Similarly, many countries, such as the Philippines for example, conduct mathematics classes in languages other than the first language for many of the students.

It is hard to imagine how students can take control of their learning activities and how the teacher can manage their learning under such adverse conditions.

Perhaps a more important limitation to a real student centred approach to learning is the distinction between the two uses of interest as used above. In English, the word interest can be used in many ways, two of which are relevant to our purposes here. According to the Cambridge Dictionary Online[2], one meaning of interest is *involvement* – things we might enjoy doing or pursue (like I have no interest in sports). Another meaning relates to *advantage* – something that affects us or bring us benefit (like it is in my interest to pay attention in class). Often, these two meanings point to conflicting interests. For example, some students might have an interest in breaking into cars or homes. Few however, in ordered societies, would argue that such activities are to the students' best interest Conversely, students who may have no interest in learning mathematics might benefit from its study. Moreover, people – arguably, more young people who have not developed sufficient life experiences - often are not aware of the implications of what they are interested in as it relates to their overall best interests. Care should be taken in understanding that this argument is not a call for complete control of students' choices or to privilege the teachers' decisions unconditionally. However, it is meant to point out some difficulties in uncritical adherence to student centred learning. It is a call for the sharing of responsibility one for the other in negotiated decision making in the classroom. In pedagogical settings this shared responsibility is in line with principles of reciprocal learning and teaching between students and teachers proposed by Vygotsky (Crawford, 1996).

Lastly, concern about uncritical adoption of student centred learning is the argument about the aims of mathematics education. A focus on student centred learning may lead to privileging the individual over the collective. Often this is manifested in constructing the primary motivation of studying mathematics as increasing access to higher education, jobs or accumulation of wealth. When social benefits of mathematics education are considered, the economic and technological developments are identified (Kuku, 1995). However, social needs and aspirations are not satisfied by preparing students for jobs and being consumers – but by them being active and critical citizens. Borrowing the terminology from Down, Ditchburn and Lee (2007), the role of mathematics education as it relates to citizenship can be at three levels. Mathematics education can contribute to the ability of students to function as effective citizens in the world. The authors call this a *conforming* ideal. This is consistent with the dominant justification of mathematics as developing skills useful for preparation for work. However, mathematics can also be used to enable students to understand how the world works (or does not work) in order to change some aspects of their world. This, the authors refer to as *reforming*. Furthermore, mathematics has an additional capacity. It can be used to create the world in a new way. The authors call this the *transforming* capacity. This is consistent with the aspirations of the critical mathematics movement.

To summarise, while a student centred approach to learning and teaching has come a long way to explain and promote student learning it does not guarantee sufficient attention to the needs and responsibilities of other players in the education process, nor does it take into account the reality of the classroom into consideration, or promote the

[2] http://www.dictionary.cambridge.org/

needs of society and the role of the individual in it. The challenge in mathematics education should be how to engage teachers in practices that engage students and how to focus on the students and *also* on pedagogy and curriculum. Perhaps, the very concept of "centred" is problematic since it implies that other factors are peripheral and hence it fails to deal with the complex phenomenon of educating students in mathematics. Here we posit an alternative approach to mathematics education based on mutual responsibility between the student and their teachers – an approach that enhances the teachers' responsibility towards the students and students' responsibility in their society. A discussion on responsibility brings us to the heart of the discourse of ethics.

Socially Response-able Mathematics Education and Ethics

Very infrequently the discussion of *ethics* is raised in mathematics education literature and this silence is paralleled by the avoidance of discussions of ethical questions in most traditions of Western philosophy. Cohen (2005) explains this avoidance of ethical discussion in philosophy as a fear of moralising, preaching and questions of values by philosophical discourses that are mainly focused on ontology rather than meaning. Similarly, in Western thinking there is a movement away from essentialist thinking represented in the universality of ethical principles (Christie, 2005) and their foundation on rationality as established by philosophers such as Kant.

For Levinas (1969, 1997), ethics is before any philosophy and is the basis of all philosophical exchanges. It precedes ontology "which is a relation to otherness that is reducible to comprehension or understanding" (Critchley, 2002, p.11). This relation to the Other that precedes understanding he calls "original relation". Chritchley points out that Levinas's original contribution to ethics is that he does not see ethics as a pre-determined set of principles that can be used to make decisions about particular instances of behaviour. Rather it is an adjective that describes a relationship with the Other that precedes any understanding and explanation. Using a phenomenological approach, Levinas argues that to be human is to be in a relationship *to the other*, or more accurately, in a relationship *for the other*. This relation is even prior to mutual obligation or reciprocity. Roth (2007) argues that this original ethical relationship discussed by Levinas consists of an "unlimited, measureless responsibility toward each other that is in continuous excess over any formalization of responsibility in the law and stated ethical principles".

Puka (2005) suggests that a great contribution to ethics is the feminist[3] distinction between responsibility and "response-ability". Response-ability highlights the ability to respond to the demands of our own well being and the ability to respond to the demands of the other. This is similar to what Roth (2007) points out, that responsibility "etymologically derives from a conjunction of the particles *re*-, doing again, *spondere*, to pledge, and *–ble*, a suffix meaning "to be able to." Responsibility therefore denotes the ability to pledge again, a form of re-engagement with the Other who, in his or her

[3] For diverse feminist stances with respect to Levinas see Chanter, T. (Ed.). (2001). Feminist interpretations of Emmanuel Levinas. Pennsylvania: Pennsylvania State University.

utterances, pledges the production of sense. Each one, on his or her own and together, is responsible for the *praxis* of sense, which we expose and are exposed to in transacting with others" (p. 5).

To summarise, here I understand the primary role of Socially Response-able Mathematics Education is to equip students with knowledge, skills and dispositions to respond to the demands of their current and future lives. To achieve these aims, students need not only to develop knowledge of mathematics and knowledge of the world, but also the ability to use mathematics to *read the world* (i.e to understand it) and *write the world* (i.e. to change it) (Gutstein, 2006). In the following two sections, I turn to the implications of this approach both to the curriculum and pedagogy.

Implications of Social Response-ability for the Curriculum

The dominance in school mathematics of the content needed for mathematically based careers – mainly science and engineering - is unwarranted and, perhaps, is a residue of times when few students finished high school and went to university. Notwithstanding the importance of jobs in science and engineering for social technological development, only a few students end up in such careers. The approach to mathematics taken here is that *all* students need considerable amount of mathematics for effective citizenship in the increasingly mathematised world of today – albeit different type of mathematics. As Skovsmose (1998) asserts, mathematics plays a role in "formatting" the world. This power of mathematics is, of course, double edged. On one hand, great achievements in history are mathematically based. But also mathematics is implicated in technologically caused catastrophes such as wars and mass destruction (D'Ambrosio, 1998). Hence, a *utilitarian* approach to mathematics falls short of developing a response-able student. As Ernest (2002) argues a critical approach to mathematics and citizenship is needed. This ethical response-ability discussion applied to mathematics education posits the primary aim of mathematics education is to enable the response-ability of students in their current and future lives as citizens.

A Socially Response-Able Mathematics Education (SRaME) approach that aims to increase social response-ability requires that a shift be made away from mere content and procedures into problem solving and applications. Further, while it is usual to find applications in mathematics from science and natural world of the student, applications from social life often remain neglected. Social applications in mathematics are often seen as contrary to rigorous mathematics that is needed for higher studies and often dealt with in special less academic courses targeting less able students. However, this binary might be counter productive by denying the majority of students, taking the so called social or practical mathematics, the opportunity and the ability to develop their generalised abstractions of mathematical concepts and procedures. Further, in spite of the rhetoric of curriculum documents, and the assurance by many teachers that the two streams deal with equally valuable mathematics – albeit for different needs - for many students a hierarchy of values exists between them resulting in higher status to the formal academic mathematics.

A SRaME approach implies a shift in the sequencing of developing mathematics knowledge and its application. The common practice in many mathematics classrooms is that students develop mathematical understandings and skills before they are able to

apply them in problem solving. Hence mathematical knowledge is often presented decontexualised and abstract. This often leads students into asking "why are we studying this?" and can result in students switching off mathematics before real and interesting applications are encountered – if indeed they are ever covered in a crowded curriculum. Mathematics education that promotes social response-ability must aim at not only developing mathematical knowledge and skills, but also knowledge and skills about the real world. The approach promoted here is for the use of real world activities to promote students' learning about their social world *while* they are learning mathematics and, at the same time, learn about mathematics *while* they are engaging with real world activities. A SRaME teacher needs to always ask what mathematics, higher order mathematics in particular, is learnt by such activities and what significant learning about the social world is anticipated. In particular, they need to raise the question 'have we learnt about mathematics, its assumptions, power and limitations as result of these activities?'

Implications of Social Response-ability for Pedagogy

In this context we understand pedagogy in the sense discussed by Lingard (2005) who, using Bernstein's (1971) elaboration, states that pedagogy goes beyond mere teaching methods or instructional techniques to include teachers' interpersonal competencies for interacting with students as well as contextual considerations and questions of power relationships enacted in the classroom.

A SRaME approach stipulates relationships between teachers and students in the classroom that are not common in traditional practices. Neyland (2004) demonstrates how in mathematics education the demand for accountability or responsibility as portrayed in the world-wide push towards standards and testing reflects a 'scientific management' rationality that posits institutions and norms as the cause of ethical behaviour. Using Levinas writings, he goes on to argue that such institutions externalise and mechanise ethical behaviour and thus "sometimes erode a primordial ethical relation between people" (p. 517). In this context, we argue that a focus on ethical response-ability shifts the focus of interactions between students and teachers from technical and system demand consideration to an encounter between two human beings, and while this is not totally free from *system* demands (Habermas, 1987), it allows for teachers' decision making based on the interest of the student.

Similarly, a SRaME approach implies a socially just pedagoy that necessarily raises the question of inclusion of marginalised groups of students in the study of mathematics. Education is often discussed as the most effective solution to addressing disadvantage in society and between societies. After at least fifty years of development and reform in education, it is important to raise the question as to whether education has been able to address this challenge. Perhaps Basil Bernstein (1971) was correct in his conclusion that schools do not compensate for society. However, there is some good news. Wide ranging reviews of the effect of educational interventions aiming to alleviate disadvantage show that increasing quality teaching does contribute to improving opportunities for marginalised groups of students (Hayes, Mills, Christie & Lingard, 2005). This research shows that quality education assists *all* students; but, as Christie (2005) comments, "it is for the most disadvantaged children that improvements in school

quality will make the most difference in achievement" (p. 245). Further, out of all the school factors that effected students' achievement the most critical was the teacher. Hence good teaching "can make a difference, but not *all* the difference" (Hayes, Mills, Christie & Lingard, 2005, p. 178). The danger of exclusion is not in challenging disadvantaged and under achieving students to higher intellectual quality, but in "dumbing down" the curriculum for them - thus locking them into marginalization and disempowerment.

This however, should not be taken to imply that a focus on quality automatically result in equity. The authors go on to discuss Productive Pedagogy[4] as a framework for reflection on pedagogy to assure it focusing on both quality and equity. The Productive Pedagogy framework consists of four main categories with each divided into several subsections:

Intellectual quality
Connectedness
Supportive classroom environment, and
Recognition of difference

An ethical response-ability places the primacy of ethical considerations in the teacher-student pedagogical encounter. There are two dangers in this encounter that erode ethical response-ability for the student. First, to deal with the students as individuals with no regard for their gender, ethnicity or socioeconomic background – factors that are demonstrably related to student achievement in mathematics - is to relate to an "abstract" student. Not only is this a recipe for failure – it also is dehumanizing and is unethical as argued by Nayland (2004). Similarly, the other extreme of seeing a student *only* as being of a particular gender, ethnicity or social status is equally counterproductive. This stereotyping also limits the possibility of an authentic encounter with the real *Other*. An ethical encounter attempts to be open to any possibility that exposes itself and responds to the students' needs and aspirations rather than in a stereotypical fashion. In supporting the students' response-ability a teacher can provide the opportunity to develop the high intellectual quality to the maximum of the students' needs and capacities. This is consistent with Vithal and Skovsmose's (1997) argument that a focus on the background of the student can obscure and hinder a focus on the *foreground* that sees possibilities as to what the student can be rather than a focus on where they have come from.

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[4] See http://education.qld.gov.au/corporate/newbasics/html/pedagogies/pedagog.html

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